Claims

METHOD FOR PRODUCING A FIBER COMPOSITE COMPONENT, AND APPARATUS FOR PRODUCING SUCH A COMPONENT

1. A method for producing a fiber composite component having at least one intersection or node point,

characterized in that

an integral fiber preform (preform) of the same or substantially the same material thickness and/or the same or substantially the same fiber volume content at the at least one intersection or node point and adjoining portions of the preform is placed in a mold, by which the component is predetermined in terms of its final geometry, and that the fiber preform, before or after being placed in the mold, is provided with a monomer or polymer and then cured.

2. The method of claim 1,

characterized in that

the cured fiber preform (blank) is pyrolized.

3. The method of claim 1,

characterized in that

the fiber preform, impregnated or saturated with a resin and/or provided with at least one polymer fiber as a matrix, is subjected to a heat process for the hardening.

4. The method of claim 1,

characterized in that

LAW OFFICES
DENNISON, SCHEINER, SCHULTZ & WAKEMAN
612 CRYSTAL SQUARE 4
1745 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VIRGINIA 22202-3417
703 412-1155

the fiber preform before being placed in a mold is provided or impregnated with the monomer such as resin or polymer and/or is subjected to the heat process in the mold.

5. The method of claim 2,

characterized in that

the resin-impregnated preform, during the heat treatment, is disposed between a lower die and an upper die of a pressing tool, and one of the dies has mold voids, which are defined by flexible elements and which predetermine the final circumferential geometry of the heat-treated preform (blank).

6. The method of claim 5,

characterized in that

for removing the blank from the mold voids, the flexible elements are deformed.

7. The method of claim 1,

characterized in that

the fiber preform comprises reinforcing fibers such as roving strands and/or fibers or slivers comprising natural, glass, aramide, polymer, carbon and/or ceramic fibers.

8. The method of claim 2,

characterized in that

a phenol-derived resin is used as the resin.

9. The method of claim 1,

characterized in that

the fibers forming the fiber preform are stitched to

LAW OFFICES
DENNISON, SCHEINER, SCHULTZ & WAKEMAN
612 CRYSTAL SQUARE 4
1745 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VIRGINIA 22202-3417
703 412-1155

achieve a desired mold that has at least one intersection point.

10. The method of claim 2,

characterized in that

the blank is carbonized at a temperature T_1 where 500°C $\leq$ T_1 $\leq$ 1450°C, and in particular 900°C $\leq$ T_1 $\leq$ 1200°C.

11. The method of claim 2,

characterized in that

the blank is graphitized at a temperature T_2 where 1500°C < T_2 $\leq$ 3000°C, and in particular 1800°C $\leq$ T_2 $\leq$ 2500°C.

12. The method of claim 7,

characterized in that

endless fibers are used as the reinforcing fibers.

13. The method of claim 1,

characterized in that

co-woven fibers, site-woven fibers, commingled fibers, intermingled fibers, demixed staple fiber yarns, or respool-spun fibers are used as the reinforcing fibers.

14. The method of claim 13,

characterized in that

polymer fibers as matrices are added to the reinforcing fibers.

15. The method of claim 14,

characterized in that

thermoplastic fibers such as PEEK fibers, PPS fibers, PA

LAW OFFICES
DENNISON, SCHEINER, SCHULTZ & WAKEMAN
612 CRYSTAL SQUARE 4
1745 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VIRGINIA 22202-3417
703 412-1155

fibers, PE fibers or PP fibers are used as the polymer fibers.

16. The method of claim 1 for producing an integral grid of a height that remains constant as a component.

17. The method of claim 1 for producing a component of fiber reinforced carbon.

18. The method of claim 1 for producing a component of fiber reinforced plastic material.

19. The method of claim 18,

characterized in that

a blank comprising fiber reinforced plastic material is carbonized and/or graphitized.

20. An apparatus for producing a component (10), comprising fiber composite material, including lower and upper dies (20, 28) of a pressing tool and optionally a heat source, by means of which source the fiber composite material can be heated during its subjection to pressure in the pressing tool,

characterized in that

one of the dies (10) has mold voids for receiving fiber composite material (18) in the form of a fiber preform (preform), which are defined by flexible elements (26), which to the requisite extent follow a shrinkage of the fiber composite material, and that the other die (28) has a geometry that follows the course of the voids.

21. The apparatus of claim 20,

characterized in that

LAW OFFICES
DENNISON, SCHEINER, SCHULTZ & WAKEMAN
612 CRYSTAL SQUARE 4
1745 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VIRGINIA 22202-3417
703 412-1155

the voids (22) are formed by intersecting receptacles for the fiber composite material or the preform (18), between which receptacles the flexible elements (26), each having a blocklike geometry, are disposed.

22. The apparatus of claim 21,

characterized in that

the die (28) that can be aligned with the intersecting receptacles (22) has a gridlike geometry and in particular comprises metal, such as steel.

23. A component produced by a method of claim 1.

LAW OFFICES
DENNISON, SCHEINER, SCHULTZ & WAKEMAN
612 CRYSTAL SQUARE 4
1745 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VIRGINIA 22202-3417
703 412-1155